

CLAIMS

What is claimed is:

1           1.       A method for transferring data from a server to at least one client,  
2       said method comprising the steps of:  
3           transforming said source data into a hierarchical representation, said  
4       hierarchical representation comprising a plurality of levels of essentially non-  
5       redundant data, wherein a level of said hierarchical representation comprises  
6       transform data sufficient to reconstruct said source data at a resolution  
7       corresponding to said level;  
8           requesting, from a client to a server, transform data from a level of said  
9       hierarchical representation necessary to reconstruct at least a portion of said source  
10      data;  
11          transferring, from said server to said client, said transform data from said  
12      hierarchical representation requested by said client; and  
13          re-constructing, at said client, said portion of said source image for display  
14      at said client with said transform data.

1           2.       The method as set forth in claim 1, further comprising the steps of:  
2           requesting, from said client to said server, transform data from said  
3       hierarchical representation necessary to reconstruct a new portion of said source  
4       data;

5           transferring, from said server to said client, additional transform data from  
6           a level of said hierarchical representation, corresponding to said new portion of  
7           said source data, down one or more lower levels of said hierarchical representation  
8           to said level previously transferred; and

9           reconstructing said new portion of said source data with said additional  
10          transform data and said transform data originally transferred, whereby only  
11          incremental transform data necessary to construct said new portion of said source  
12          data at said client is transferred from said server to said client.

1           3.       The method as set forth in claim 1, wherein:

2           the step of transforming said source data into a hierarchical representation  
3           comprises the step of utilizing a wavelet transform to generate a plurality of low  
4           pass coefficients and a plurality of high pass coefficients;

5           the step of requesting data from said hierarchical representation comprises  
6           the step of transferring coefficient coordinates to identify coefficients sufficient to  
7           re-construct said portion of said source image; and

8           the step of re-constructing said portion of said source image comprises the  
9           step of transforming said coefficients to generate said portion of said source  
10          image.

1           4.       The method as set forth in claim 3, wherein the step of utilizing a  
2           wavelet transform to generate a plurality of low pass coefficients and a plurality

3 of high pass coefficients comprises the step of generating low pass coefficients for  
4 each level of said hierarchical representation, so as to aggregate sufficient  
5 information to render a viewable display of said source image at a resolution  
6 corresponding to said level.

1 5. The method as set forth in claim 3, wherein:  
2 the step of utilizing a wavelet transform to generate a plurality of low pass  
3 coefficients and a plurality of high pass coefficients comprises the step of  
4 generating a wavelet transform using fixed point kernels; and  
5 the step of requesting, from said client to said server, transform data  
6 comprises the step of transferring  $O(N)$  coefficients to represent "N" pixels for  
7 display at said client, wherein "N" comprises an integer value.

1 6. The method as set forth in claim 1, wherein the step of  
2 transforming said source data into a hierarchical representation comprises the step  
3 of executing a finite impulse response function to generate said transform data.

1 7. The method as set forth in claim 1, wherein the step of  
2 transforming said source data into a hierarchical representation comprises the step  
3 of preserving geometry between said source data and said transform data, so that  
4 any portion of said source data is identifiable from a portion of said transform  
5 data.

1           8.       A method for transferring data images from a server to at least one  
2 client, said method comprising the steps of:

3                 generating a hierarchical representation of a source image, said hierarchical  
4 representation comprising a plurality of levels of essentially non-redundant data,  
5 wherein a level of said hierarchical representation comprises data sufficient to  
6 reconstruct said source image at a resolution corresponding to said level;

7                 transferring, from a server to a client, at least a portion of data from a  
8 level of said hierarchical representation of said source image at a first resolution,  
9 said first resolution being less than full resolution of said source image;

10                requesting, from said client to said server, data from said hierarchical  
11 representation, additional to said portion of data transferred, necessary to  
12 reconstruct said source image at pixel coordinates for said source image; and

13                transferring, from said server to said client, said additional data requested  
14 to display at said client said source image at said pixel coordinates, whereby only  
15 data of said hierarchical representation necessary to construct said source image  
16 at a pre-determined resolution at said client is transferred from said server to said  
17 client.

1           9.       The method as set forth in claim 8, wherein:

2                 the step of generating a hierarchical representation of a source image  
3 comprises the step of generating a wavelet decomposition for each level of said

4 hierarchical representation comprising low pass coefficients and a plurality of high  
5 pass coefficients;

6 the step of transferring, from a server to a client, data from a level of said  
7 hierarchical representation comprises the step of transferring low pass coefficients  
8 corresponding to a level for said first resolution; and

9 the step of requesting, from said client to said server, additional data,  
10 comprises the step of transferring additional high pass coefficients necessary to  
11 construct said source image at said pixel coordinates.

1 10. The method as set forth in claim 8, wherein:

2 the step of generating a hierarchical representation of a source image  
3 comprises the step of generating a wavelet decomposition, using fixed point  
4 kernels, for each level of said hierarchical representation to generate a plurality  
5 of coefficients; and

6 the step of requesting, from said client to said server, additional data,  
7 comprises the step of transferring  $O(N)$  coefficients to present "N" pixels for said  
8 pixel coordinates, wherein "N" comprises an integer value.

1 11. The method as set forth in claim 8, wherein:

2 the step of transferring, from a server to a client, at least a portion of data  
3 comprises the step of transferring a portion of said source image at a zoom  
4 resolution greater than a resolution capable of display at said client; and

5           the step of requesting, from said client to said server, data from said  
6           hierarchical representation comprises the step of requesting pixel coordinates to  
7           pan said source image at a resolution at least as great as said zoom resolution.

1           12.     The method as set forth in claim 8, wherein:

2           the step of transferring, from a server to a client, at least a portion of data  
3           comprises the step of transferring said source image at said first resolution; and  
4           the step of requesting, from said client to said server, data from said  
5           hierarchical representation comprises the step of requesting pixel coordinates at a  
6           second resolution, greater than said first resolution.

1           13.     A system comprising:

2           a server for storing source data as a hierarchical representation, said  
3           hierarchical representation comprising a plurality of levels of essentially non-  
4           redundant data, wherein a level of said hierarchical representation comprises  
5           transform data sufficient to reconstruct said source data at a resolution  
6           corresponding to said level;

7           at least one client, coupled to communicate with said server, said client  
8           requesting to said server transform data from a level of said hierarchical  
9           representation necessary to reconstruct at least a portion of said source data;

10          said server for transferring to a client said transform data from said  
11          hierarchical representation upon request by said client; and

12           said client for re-constructing, at said client, said portion of said source  
13   image for display at said client with said transform data.

1           14.    The system as set forth in claim 13, wherein:  
2           said client further comprises software for requesting, to said server,  
3   transform data from said hierarchical representation necessary to reconstruct a new  
4   portion of said source data;  
5           said server further comprises software for transferring, to said client,  
6   additional transform data from a level of said hierarchical representation,  
7   corresponding to said new portion of said source data, down one or more lower  
8   levels of said hierarchical representation to said level previously transferred; and  
9           said client further comprises software for reconstructing said new portion  
10   of said source data with said additional transform data and said transform data  
11   originally transferred, whereby only incremental transform data necessary to  
12   construct said new portion of said source data at said client is transferred from said  
13   server to said client.

1           15.    A computer readable medium comprising a plurality of instructions,  
2   which when executed by a computer, cause the computer to perform the steps of:  
3           transforming said source data into a hierarchical representation, said  
4   hierarchical representation comprising a plurality of levels of essentially non-  
5   redundant data, wherein a level of said hierarchical representation comprises

6 transform data sufficient to reconstruct said source data at a resolution  
7 corresponding to said level;

8 requesting, from a client to a server, transform data from a level of said  
9 hierarchical representation necessary to reconstruct at least a portion of said source  
10 data;

11 transferring, from said server to said client, said transform data from said  
12 hierarchical representation requested by said client; and

13 re-constructing, at said client, said portion of said source image for display  
14 at said client with said transform data.

1 16. The computer readable medium as set forth in claim 15, further  
2 comprising the steps of:

3 requesting, from said client to said server, transform data from said  
4 hierarchical representation necessary to reconstruct a new portion of said source  
5 data;

6 transferring, from said server to said client, additional transform data from  
7 a level of said hierarchical representation, corresponding to said new portion of  
8 said source data, down one or more lower levels of said hierarchical representation  
9 to said level previously transferred; and

10 reconstructing said new portion of said source data with said additional  
11 transform data and said transform data originally transferred, whereby only  
12 incremental transform data necessary to construct said new portion of said source



13 data at said client is transferred from said server to said client.

1 17. The computer readable medium as set forth in claim 15, wherein:  
2 the step of transforming said source data into a hierarchical representation  
3 comprises the step of utilizing a wavelet transform to generate a plurality of low  
4 pass coefficients and a plurality of high pass coefficients;  
5 the step of requesting data from said hierarchical representation comprises  
6 the step of transferring coefficient coordinates to identify coefficients sufficient to  
7 re-construct said portion of said source image; and  
8 the step of re-constructing said portion of said source image comprises the  
9 step of transforming said coefficients to generate said portion of said source  
10 image.

1 18. The computer readable medium as set forth in claim 17, wherein  
2 the step of utilizing a wavelet transform to generate a plurality of low pass  
3 coefficients and a plurality of high pass coefficients comprises the step of  
4 generating low pass coefficients for each level of said hierarchical representation,  
5 so as to aggregate sufficient information to render a viewable display of said  
6 source image at a resolution corresponding to said level.

1 19. The computer readable medium as set forth in claim 17, wherein:

2           the step of utilizing a wavelet transform to generate a plurality of low pass  
3           coefficients and a plurality of high pass coefficients comprises the step of  
4           generating a wavelet transform using fixed point kernels; and  
5           the step of requesting, from said client to said server, transform data  
6           comprises the step of transferring  $O(N)$  coefficients to represent "N" pixels for  
7           display at said client, wherein "N" comprises an integer value.

1           20.    The computer readable medium as set forth in claim 15, wherein  
2           the step of transforming said source data into a hierarchical representation  
3           comprises the step of executing a finite impulse response function to generate said  
4           transform data.

1           21.    The computer readable medium as set forth in claim 15, wherein  
2           the step of transforming said source data into a hierarchical representation  
3           comprises the step of preserving geometry between said source data and said  
4           transform data, so that any portion of said source data is identifiable from a  
5           portion of said transform data.